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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Bruno GHYSELEN et al.	Confirmation No.: 8599
Patent No.: 6,982,210 B2	Application No.: 10/728,341
Patent Date: January 3, 2006	Filing Date: December 3, 2003
For: METHOD FOR MANUFACTURING A MULTILAYER SEMICONDUCTOR STRUCTURE THAT INCLUDES AN IRREGULAR LAYER	Attorney Docket No.: 4717-12800

REQUEST FOR CERTIFICATE OF CORRECTION UNDER 37 C.F.R. § 1.322

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Patentees hereby respectfully request the issuance of a Certificate of Correction in connection with the above-identified patent. The corrections are listed on the attached Form PTO-1050. The corrections requested are as follows:

At column 8, line 14 (claim 1, line 5), after "interface with the donor substrate and having", change "a" to -- an --.

At column 8, line 55 (claim 9, line 3), after "the wafer to an appropriate", change "beat" to -- heat --.

The requested corrections are for errors that appear to have been made by the Office. Therefore, no fee is believed to be due for this request. Should any fees be required, however, please charge such fees to Winston & Strawn LLP Deposit Account No. 50-1814. Please issue a Certificate of Correction in due course.

Respectfully submitted,

1/10/06
Date

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO.: 6,982,210 B2
DATED: January 3, 2006
INVENTORS: Ghyselen et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 8:
Line 14, after "interface with the donor substrate and having", change "a" to -- an --.
Line 55, after "the wafer to an appropriate", change "beat" to -- heat --.

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Method III

In this principal embodiment, the stages are performed in the following order: B, A, C, D, E and F. Stage B corresponds to the creating a weakened zone in the thickness of the donor substrate **10**. This weakened zone can, as in the other embodiments according to the invention, be created by implanting atomic species into the thickness of the donor substrate. It is possible in this embodiment of the invention to carry out the implantation step as described above for Methods I and II so that detachment can then be conducted by simple heat annealing. It is also possible to "under dose" the implanting of atomic species, as will be explained. In every case, a flat weakened zone **13** is obtained as implantation is not carried out through a layer of irregular material

It is also possible to create a weakened zone via other methods, in particular by providing a donor substrate **10** that includes a "detachable" area along the zone **13**. Such a detachable substrate, in which detachment can be conducted by a mechanical action along the weakened zone **13**, can be created for example by creation of a porous region in the thickness of the substrate **10**. For this purpose, it is possible to utilize a thin layer of porous silicon on a single-crystal silicon substrate, and then to cover this layer of porous silicon with another layer of single-crystal silicon (obtained for example via epitaxy). In this regard reference can be made to U.S. Pat. No. 6,100,166 (which describes an ELTRAN® type process).

A detachable donor substrate **10** may also be made by bonding two substrates **101** and **102** (see FIG. **7**), the bonding conditions being defined so as to limit the bonding energy. In this case, the bonding is reversible under the effect of a mechanical action. In an implementation, this bonding, for example, brings two layers of oxide **1010** and **1020** into contact.

In another variation, a detachable substrate may be created by forming an implanted weakened zone **13** by using an implantation dosage inferior to that which would be required to create a zone that could be detached solely by being subject to a high heat budget. Such an implantation is "under dosed" in comparison to that required, for example, for the implantation step of a SMART-CUT® type process. The use of an under-dosed implantation allows the creation of a weakened zone **13** wherein the donor substrate can only be detached by applying a mechanical constraint (this mechanical constraint being itself applied after the weakened zone **13** is subjected to a heat budget to allow coalescence of this zone).

In all cases, a weakened zone **13** is created in the thickness of the donor substrate **10**, which corresponds to stage B. Then a layer of irregular material **12** is deposited on the donor substrate **10**. This corresponds to stage A. Once again, the depositing step can be carried out under the same conditions as previously described. The irregular surface of the layer **12** is then flattened, preferably by covering it with an intermediate layer **14** as described above. The result of stages B, A and C for this third embodiment is shown in FIG. **7**.

Referring to FIG. **7**, an intermediate structure **100** has again been created, which includes a weakened zone **13** and a layer of irregular material **12** on a donor substrate **10**. This structure can be positioned or turned over for bonding with a receiver substrate **20**. Such positioning and bonding correspond to the next stage D. The donor substrate **10** is detached along the weakened zone **13** (stage E). In the case where the weakened zone **13** is created solely via an implantation step, and with sufficient dosage, detachment can be achieved by simply subjecting the structure to an adequate heat budget (as for the detachment carried out in methods I and II). If a detachable substrate has been used, a mechanical action will be required in most cases to achieve the detachment. The resulting structure is represented in FIG. **8**.

Finally, it is once again possible to thin the resulting wafer and/or to treat its surface. The resulting structure that is finally obtained is shown in FIG. **9**.

What is claimed is:

1. A method for manufacturing a multilayer semiconductor structure that includes an irregular layer, comprising:

providing a layer of irregular material on a donor substrate to form an irregular layer having a flat face at an interface with the donor substrate and having a opposite, irregular face;

creating a weakened zone at a predetermined depth within the donor substrate;

providing an intermediate layer of material that covers the irregular face of the irregular layer, the intermediate layer providing a substantially flat surface;

bonding the substantially flat surface of the intermediate layer to a receiver substrate; and

detaching the donor substrate along the weakened zone to form the multilayer semiconductor structure that includes a useful layer, the irregular layer, the intermediate layer and the receiver substrate, wherein all of the irregular material of the irregular layer is present in the structure.

2. The method of claim **1** which further comprises treating the substantially flat surface of the intermediate material layer prior to bonding.

3. The method of claim **1** which further comprises implanting atomic species into the donor substrate to a controlled mean implantation depth to form the weakened zone.

4. The method of claim **1** which further comprises heat treating to detach the donor wafer from the multilayer semiconductor structure.

5. The method of claim **1** wherein the intermediate layer is provided prior to creating the weakened zone in the donor substrate.

6. The method claim **1** wherein the weakened zone is created in the donor substrate prior to providing the intermediate material layer.

7. The method claim **1** wherein the weakened zone is created in the donor substrate prior to providing the layer of irregular material on the donor substrate.

8. The method of claim **7** which further comprises implanting atomic species into the donor substrate to a controlled mean implantation depth to form the weakened zone.

9. The method of claim **8** which further comprises detaching the donor substrate along the weakened zone by exposing the wafer to an appropriate beat budget.

10. The method of claim **7** which further comprises fabricating a detachable donor substrate having a weakened zone.

11. The method of claim **10** which further comprises creating the weakened zone by at least one of providing a porous region in the donor substrate, providing a reversible bonding interface between two wafers that comprise the donor substrate, or implanting atomic species into the donor substrate with a dosage that requires a predetermined amount of mechanical energy to detach the donor substrate along the weakened zone.